

Multi-Layered Nanoscale Wire Grid Polarizers for Visible and Near-IR Imaging Systems



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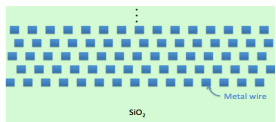
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Introduction

Human eyes and conventional cameras can only perceive the wavelength of light as color, and intensity as brightness. However both of them ignore the polarization nature of light. Polarization describes the directional properties of electric field, which contains additional useful information about an image. Information about the polarization could be used in the identification of materials, non-contact fingerprint detection, remote sensing and computer vision.

Objectives

- Develop a coupled wave model to study the multi-layered metal grid structures
- Fabricate a multi-layered wire grid polarizer using deep-UV interference lithography
- Evaluate its performance in the visible and near-infrared region.



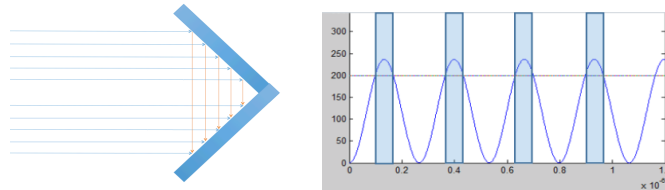
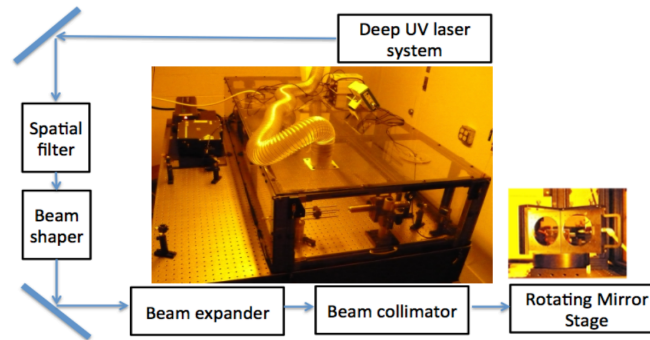
Methods

Rigorous coupled Wave Analysis (RCWA) model

- Electric field in the incident, grating and substrate regions can be expanded in a set of plane waves satisfying the Floquet condition.
- Boundary conditions will be applied to solve for reflected and transmitted amplitudes in the incident and substrate medium as well as the mode amplitudes in the grating region.

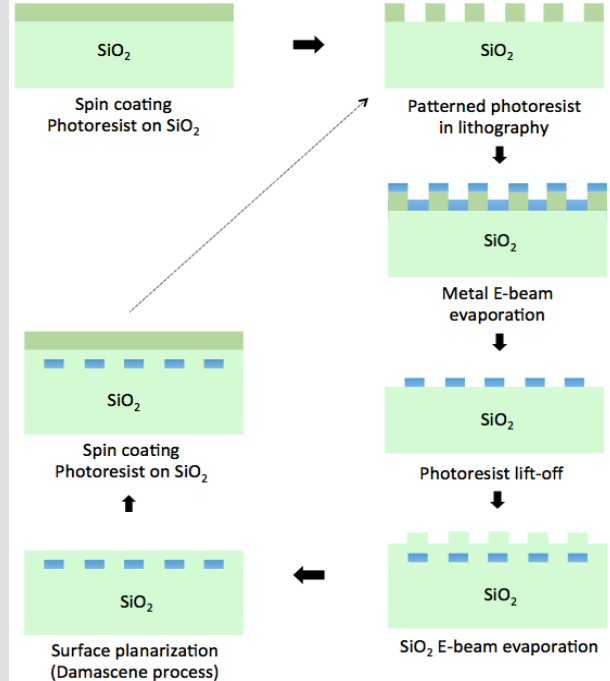
Deep ultraviolet (UV) Interference lithography

- Coherent 266 nm light wave filtered, expanded, collimated to produce an uniform illumination on a Lloyd's mirror.
- Lloyd's mirror enables the periodic interference pattern between two



Step flow

Multi-layered Metal Wire Grids Polarizer



References

David Lombardoa, Piyush Shah, Pengfei Guo, Andrew Sarangan, "Deep-UV Interference Lithography combined with Masked Contact Lithography for Pixel Wiregrid Patterns", SPIE Advanced Lithography, Paper 9777-46 (2016)